Horizon Actuarial Services, LLC

Survey of Capital Market Assumptions

2018 Edition

Horizon Actuarial Services, LLC is proud to serve as the actuary to over 100 multiemployer defined benefit pension plans across the United States and across various industries. As actuary to these plans, we must develop assumptions regarding future investment returns on plan assets. We then use those assumptions as we determine the actuarial values of the benefits promised by these plans to their participants and beneficiaries, as well as to project plan funding and solvency levels years into the future.

At Horizon Actuarial, we are actuaries, not investment professionals. Therefore, when developing assumptions as to what returns a pension plan's assets might be expected to earn in the future, we look to our colleagues in the investment advisory community. Each year, as part of this survey, we ask different investment firms to provide their "capital market assumptions" – their expectations for future risk and returns for different asset classes in which pension plans commonly invest. The information gathered from this survey can help answer the common question: "Are my plan's investment return assumptions reasonable?"

There are many factors to consider when evaluating a plan's investment return assumptions, such as its asset allocation and the maturity of its participant population. Any of these factors can make the expected return for one plan very different from others. Therefore, this report does not opine on the reasonableness of any one plan's investment return assumptions. Nevertheless, we hope this report will be a useful resource for trustees, actuaries, and investment professionals alike.

Horizon Actuarial sincerely thanks the 34 investment advisors who participated in this survey.

Atlanta ▪ Cleveland ▪ Denver ▪ Irvine ▪ Los Angeles
Miami ▪ San Diego ▪ Washington, D.C.

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Summary

Horizon Actuarial first conducted this survey in 2010, and it included 8 investment advisors. In 2012, we first published a report on the survey results, which included 17 advisors. The survey has expanded considerably over the past few years; this 2018 edition of the survey includes assumptions from 34 different investment firms.

In general, expected returns have declined in recent years. When we focus on the 22 advisors who participated in each of the last five surveys, we see that expected returns for equity and alternative investments generally decreased from 2014 to 2018. During the same period, expected returns for core fixed income and U.S. Treasuries have remained relatively flat. Expected volatilities for alternative investments have decreased in recent years, but have not changed significantly for other asset classes.

As we have seen in prior surveys, expected returns are noticeably lower over the short term than over the long term. This trend is apparent when we focus on the 13 advisors who provided assumptions for both the short term (up to 10 years) and long term (20 years or more). In fact, the difference between short-term and long-term expectations is more pronounced in this 2018 survey than it has been in any year since the survey began developing separate 10-year and 20-year expected returns in 2013.

For ongoing pension plans without solvency issues, we believe a horizon of 20 years or more is appropriate for evaluating the reasonableness of the long-term investment return assumption. A shorter horizon, such as 10 years, may be more appropriate for evaluating the return assumption for a plan that is more mature or has solvency issues. Even for plans with long-term investment horizons, it is important to understand the potential impact of lower expected returns over the short term. Therefore, this survey shows return expectations over horizons of both 10 years and 20 years.

For illustration, this report also constructs an asset allocation for a hypothetical multiemployer pension plan and uses the results from the survey to develop a range of reasonably expected returns for the plan. When compared to the 2017 edition of the survey, the expected returns for this 2018 edition were lower over 10-year and 20-year horizons by 23 and 16 basis points, respectively. These decreases were primarily driven by lower expected returns across most asset classes for many of the advisors who participated in both the 2017 survey and the 2018 survey.

If you have questions about how the results of this survey relate to your multiemployer plan, please contact your consultant at Horizon Actuarial or visit the "contact us" page on our website, www.horizonactuarial.com. For questions about the survey itself, please contact Ben Ablin at ben.ablin@horizonactuarial.com.

Survey Participants

Exhibit 1 below lists the 34 investment advisors whose capital market assumptions are included in the 2018 survey. This report does not attribute specific assumptions to individual firms, which is a precondition of the survey.

Originally, this survey was exclusive to the multiemployer plan community; it included only assumptions from investment advisors to multiemployer pension plans. The survey has expanded over the years, and it now includes assumptions from investment advisors outside of the multiemployer plan community.

Of the 34 sets of capital market assumptions included in the 2018 edition of the survey, 27 were provided by investment advisors to multiemployer plans, 4 were obtained from published white papers, and 3 were provided by investment advisors who do not consult with multiemployer plans. A complete listing of the firms participating in the survey is provided below.

Exhibit 1

2018 Survey Participants

AJ Gallagher	*Marquette Associates*
Alan Biller	*Meketa Investment Group*
AndCo Consulting	*Merrill Lynch Global Institutional Consulting*
Aon Hewitt	*Morgan Stanley Wealth Management*
The Atlanta Consulting Group	*New England Pension Consultants (NEPC)*
*Bank of New York Mellon**	*Pavilion Advisory Group*
*BlackRock**	*Pension Consulting Alliance*
Callan Associates	*PFM Asset Management, LLC*
Cambridge Associates	*RVK*
CapTrust	*Segal Marco Advisors*
Ellwood Associates	*SEI*
*Envestnet***	*Sellwood Consulting*
Goldman Sachs Asset Management	*Summit Strategies Group*
Graystone Consulting	*UBS*
Investment Performance Services, LLC (IPS)	*Verus*
Janney Montgomery Scott, LLC	*Voya Investment Management**
*J.P. Morgan Asset Management**	*Willis Towers Watson***

* Assumptions obtained from published white paper
** Advisor from outside multiemployer community

Investment Horizons

When evaluating the expected return assumption for an active, ongoing multiemployer pension plan, actuaries usually consider investment returns over a long-term investment horizon of 20 years or more. A shorter time horizon, say over the next 10 years, may be more appropriate when evaluating the return assumption for a mature plan, a plan that has high negative cash flows, or a plan that is projected to become insolvent.

It is also important to understand the sensitivity of plan funding to changes in future investment returns. For example, the actuary for an active, ongoing pension plan will typically set the plan's investment return assumption based on expectations over a long-term horizon. However, evaluating the sensitivity of funding results to short-term investment returns that are expected to be higher or lower than the long-term assumption also plays an integral role in the decision making process.

Survey participants were requested to provide their most recent capital market assumptions: expected returns for different asset classes, standard deviations (i.e., volatilities) for those expected returns, and a correlation matrix. The survey participants were also requested to indicate the investment horizon(s) to which their assumptions apply. If the participant develops separate assumptions for different time horizons, they were requested to provide each set of assumptions.

In the 2018 edition of the survey, 21 advisors provided one set of assumptions: of those, 19 specified a time horizon of 10 years and 2 specified a time horizon of 10 to 15 years. The remaining 13 advisors provided assumptions over both shorter-term (5 to 10 years) and longer-term (20 years or more) horizons.

Exhibit 2 below summarizes the time horizons specified by each advisor, grouped by type.

Exhibit 2

Investment Time Horizons

Advisor Type	(A)	(B)	(C)	Total
10 Years	14	3	2	19
10 to 15 Years	1	1	-	2
Both Short- and Long-Term	12	-	1	13
Total	27	4	3	34

(A) Multiemployer plan investment advisor
(B) Published white paper
(C) Advisor from outside multiemployer community

Short-Term vs. Long-Term

As noted in the previous section, survey participants provided expected returns over different time horizons. Given current market conditions, many investment advisors may expect returns for certain asset classes to be different in the short term versus over the long term.

For comparability, this survey groups expected returns into two time horizons: 10 years and 20 years. As pension plan actuaries, we often refer to the 10-year expected returns as "short-term" and the 20-year expected returns as "long-term." Note, however, that many investment firms consider 10-year expectations to be "long-term."

When comparing the expected returns for the 13 advisors who provided both short-term and long-term assumptions,[1] we see some interesting differences. See Exhibit 3 below. Expected returns are geometric and are generally considered to be indexed and net of fees.

Exhibit 3

Average Expected Returns: Short-Term vs. Long-Term
Subset of 13 Survey Respondents

Asset Class	10-Year Horizon	20-Year Horizon	Difference
US Equity - Large Cap	6.24%	7.42%	1.18%
US Equity - Small/Mid Cap	6.97%	8.18%	1.21%
Non-US Equity - Developed	7.05%	7.71%	0.66%
Non-US Equity - Emerging	7.85%	8.82%	0.97%
US Corporate Bonds - Core	3.59%	4.46%	0.87%
US Corporate Bonds - Long Dur.	3.36%	4.44%	1.08%
US Corporate Bonds - High Yield	4.81%	5.82%	1.01%
Non-US Debt - Developed	2.19%	3.22%	1.03%
Non-US Debt - Emerging	5.24%	6.13%	0.89%
US Treasuries (Cash Equivalents)	2.51%	3.05%	0.54%
TIPS (Inflation-Protected)	3.23%	4.04%	0.81%
Real Estate	5.87%	6.66%	0.79%
Hedge Funds	5.46%	6.19%	0.73%
Commodities	4.73%	4.92%	0.19%
Infrastructure	6.77%	7.14%	0.37%
Private Equity	8.59%	9.52%	0.93%
Inflation	2.41%	2.47%	0.06%

The 10-year and 20-year returns shown above are the averages for the 13 advisors who provided both short-term and long-term assumptions.
Expected returns are annualized (geometric).

The consensus among these 13 advisors was that returns are expected to be lower in the short term compared to the long term. In general, the difference between long-term and short-term returns is more pronounced for US equity and fixed income investments.

As noted earlier, the results shown in Exhibit 3 are based on a subset of 13 advisors. If we include all 34 survey advisors, the short-term and long-term expected returns do not change dramatically. See Exhibit 4 below.

Exhibit 4

Average Expected Returns: Short-Term vs. Long-Term
All Survey Respondents

Asset Class	10-Year Horizon	20-Year Horizon	Difference
US Equity - Large Cap	6.07%	7.42%	1.35%
US Equity - Small/Mid Cap	6.57%	8.18%	1.61%
Non-US Equity - Developed	6.71%	7.71%	1.00%
Non-US Equity - Emerging	7.64%	8.82%	1.18%
US Corporate Bonds - Core	3.37%	4.46%	1.09%
US Corporate Bonds - Long Dur.	3.32%	4.44%	1.12%
US Corporate Bonds - High Yield	4.78%	5.82%	1.04%
Non-US Debt - Developed	2.18%	3.22%	1.04%
Non-US Debt - Emerging	5.00%	6.13%	1.13%
US Treasuries (Cash Equivalents)	2.48%	3.05%	0.57%
TIPS (Inflation-Protected)	2.88%	4.04%	1.16%
Real Estate	5.90%	6.66%	0.76%
Hedge Funds	4.96%	6.19%	1.23%
Commodities	3.97%	4.92%	0.95%
Infrastructure	6.56%	7.14%	0.58%
Private Equity	8.33%	9.52%	1.19%
Inflation	2.24%	2.47%	0.23%

10-year horizon results include all 34 survey respondents.
20-year horizon results include a subset of 13 survey respondents.
Expected returns are annualized (geometric).

The 10-year expected returns shown above include assumptions from all 34 advisors, while the 20-year expected returns include assumptions from only the 13 advisors who provided longer-term assumptions.

While past editions of this survey have indicated lower expected returns over the short term than over the long term, the difference has increased in recent years for most asset classes. For example, the difference between short term expected returns and long term expected returns for large cap US equity based on the average assumptions from the 2018 survey is 135 basis points. For comparison, the difference was 88 basis points based on the average assumptions from the 2014 survey.

For this reason, it may be more important than ever for the actuary to evaluate the sensitivity of funding results to short-term investment returns that are expected to be lower than the long-term assumption.

[1] In cases where an advisor indicated a time horizon shorter than 10 years, the shorter-term expected returns were combined with the longer-term expected returns to achieve a 10-year horizon. Similarly, if an advisor indicated a time horizon longer than 20 years, the longer-term expected returns were combined with the shorter-term expected returns to achieve a 20-year horizon.

Differing Opinions

Exhibit 5 below shows the distribution of expected returns and standard deviations (i.e., volatilities) for each asset class in the survey, as provided by the 34 individual advisors in the survey. Expected returns are geometric and apply to a 10-year investment horizon. Average assumptions from the 2018 survey are listed in brackets for each asset class. As noted earlier, returns are assumed to be indexed and net of fees.

Note that the exhibit below focuses on a 10-year horizon in order to include assumptions from all 34 advisors. See Exhibit 16 in the appendix to this report for the assumptions over a 20-year horizon, based on the 13 advisors who provided longer-term assumptions. Also note that the exhibit considers both expected returns and standard deviations. The ranges of expected returns by asset class can be found in the appendix as Exhibits 17 and 18.

The exhibit below shows that there are significant differences in expected returns and standard deviations among investment advisors. As the saying goes, "reasonable people may differ."

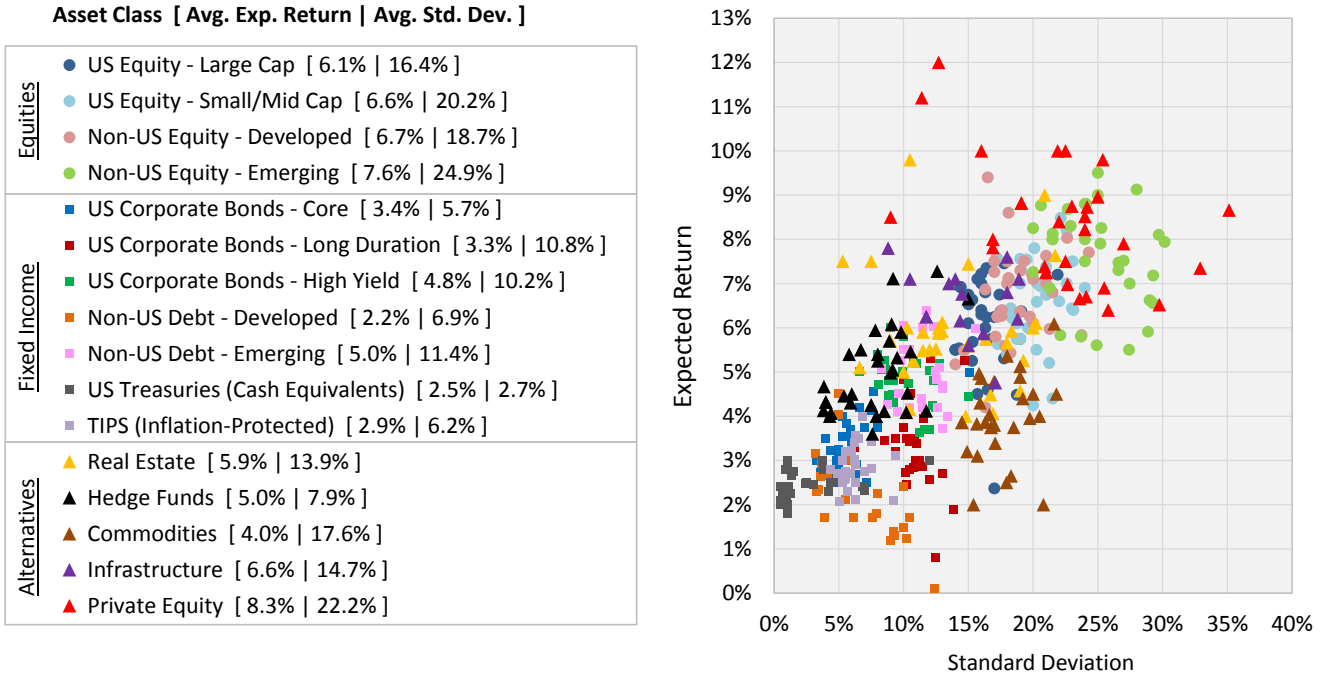
The differences in assumptions are more pronounced for alternative investments such as real estate, hedge funds, and private equity. A contributing factor may be differences in the underlying strategies different advisors apply to these alternative investments (for example, opportunistic versus defensive). To contrast, the differences in expected returns and volatilities are smaller for more traditional investments, such as US equity and US fixed income.

A summary of the average survey assumptions can be found in the appendix to this report as Exhibit 15. This summary includes expected returns, standard deviations, and a correlation matrix.

Exhibit 5

2018 Survey: Distribution of Expected Returns and Standard Deviations

10-Year Horizon | Geometric Returns



Changing Outlooks: 2014 to 2018

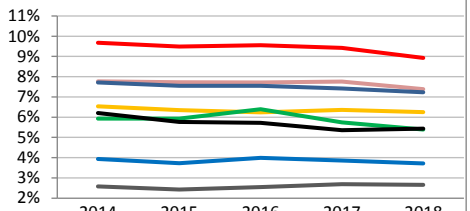
In recent years, there has been much discussion about whether it is reasonable to expect that future investment returns will be as high as they have been historically. Citing various reasons such as increased equity prices, tightening credit spreads, and continuing low interest rates, many advisors have lowered their expectations over the last five years, especially from 2017 to 2018.

Exhibit 6 below shows average expected returns for selected asset classes each year from 2014 to 2018. For consistency, this exhibit includes only the 22 advisors who participated in the survey in each of these years.

Note that the expected returns shown below are based on a 20-year horizon for advisors who provided longer-term assumptions and a 10-year horizon for others.[2] For that reason (as well as the fact that we include only a subset of advisors), the expected returns shown below are not directly comparable with those in other sections or previous surveys.

Exhibit 6

Average Expected Returns: 2014 - 2018



	2014	2015	2016	2017	2018
Private Equity	9.7%	9.5%	9.6%	9.4%	8.9%
Non-US Eq. (Dev)	7.8%	7.7%	7.7%	7.8%	7.4%
US Eq. (Large Cap)	7.7%	7.5%	7.5%	7.4%	7.2%
Real Estate	6.5%	6.4%	6.2%	6.4%	6.2%
US Bonds (HY)	5.9%	5.9%	6.4%	5.7%	5.4%
Hedge Funds	6.2%	5.8%	5.7%	5.4%	5.4%
US Bonds (Core)	3.9%	3.7%	4.0%	3.9%	3.7%
US Treasuries	2.6%	2.4%	2.5%	2.7%	2.7%

Figures are average geometric returns for selected asset classes for the 22 advisors who participated in each of the surveys from 2014 through 2018.

For this subset of advisors, average expected returns have decreased for every asset class except US Treasuries over the last five years. The sharpest declines from 2017 to 2018 were for the asset classes with the highest expected returns – private equity and non-US developed equity.

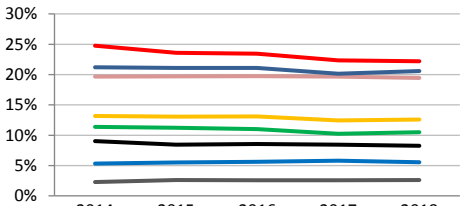
Other asset classes, such as large cap US equity, real estate, high-yield bonds, and hedge funds have seen more gradual declines over the course of the last five years.

Average expected returns asset classes with lower expected returns such as core fixed income and US Treasuries remained relatively flat from 2014 to 2018.

In addition to expected returns, it is also important to consider expected volatility of the returns, measured by standard deviations. Average standard deviations over the last five years are shown in Exhibit 7 below.

Exhibit 7

Average Standard Deviations: 2014 - 2018



	2014	2015	2016	2017	2018
Private Equity	24.8%	23.6%	23.4%	22.3%	22.2%
Non-US Eq. (Dev)	19.7%	19.7%	19.7%	19.7%	19.5%
US Eq. (Large Cap)	21.2%	21.1%	21.1%	20.1%	20.6%
Real Estate	13.2%	13.1%	13.1%	12.4%	12.6%
US Bonds (HY)	11.4%	11.2%	11.0%	10.3%	10.5%
Hedge Funds	9.0%	8.5%	8.6%	8.4%	8.3%
US Bonds (Core)	5.3%	5.5%	5.6%	5.8%	5.6%
US Treasuries	2.3%	2.6%	2.6%	2.6%	2.6%

Figures are average standard deviations for selected asset classes for the 22 advisors who participated in each of the surveys from 2014 through 2018.

In general, average standard deviations have decreased from 2014 to 2018. This decrease may be related to the decrease in average expected returns over the same period as investments with lower expected returns are often less volatile than investments with higher expected returns. This trend of decreasing standard deviations is most apparent for private equity, but noticeable shifts have occurred for large cap US equities, real estate, and high-yield bonds as well.

On the contrary, average standard deviations have increased for investments whose returns are more closely tied to interest rates such as core US bonds and US Treasuries. This increase may indicate greater uncertainty about the timing of future changes in interest rates or the rate at which those rates are expected to change.

[2] Of the 13 survey advisors who provided both shorter-term and longer-term assumptions, 11 of them indicated no difference in the standard deviations of the expected returns over the short term versus the long term. For the other 2 advisors, the differences between short-term and long-term standard deviations were very minor.

Evaluating the Return Assumption

Multiemployer pension plans are usually invested in a well-diversified mix of stocks, bonds, real estate, and alternative investments structured to meet the goals of the Trustees. This typically involves maximizing returns over the long term while minimizing return volatility.

The actuary of a multiemployer pension plan must evaluate the plan's asset allocation and, based on expectations of future returns, develop an assumption for what plan assets are projected to earn over the long term. This assumption is then used (along with others) to determine the actuarial present value of the benefits promised by the plan to its participants and beneficiaries.

The actuary will often rely on the future return expectations of the plan's investment advisor in developing the plan's investment return assumption. However, as noted earlier, different investment advisors often have widely differing opinions on what future returns will be. Therefore, it can be beneficial to keep in mind other advisors' expectations when setting the investment return assumption.

In the following exhibits, we will evaluate the investment return assumption for a hypothetical multiemployer pension plan. Exhibit 8 below shows the asset allocation for this hypothetical plan. The asset allocations are arbitrary, except for the fact that we made sure to include at least a small allocation to every asset class in the survey.

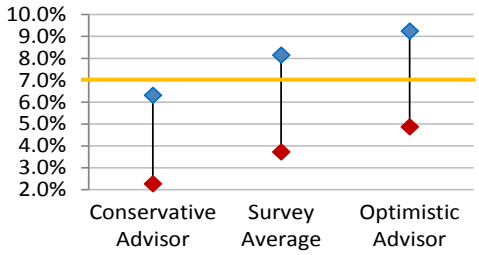
Exhibit 8

Hypothetical Multiemployer Plan	
Asset Class	**Weight**
US Equity - Large Cap	20.0%
US Equity - Small/Mid Cap	10.0%
Non-US Equity - Developed	7.5%
Non-US Equity - Emerging	5.0%
US Corporate Bonds - Core	7.5%
US Corporate Bonds - Long Duration	2.5%
US Corporate Bonds - High Yield	5.0%
Non-US Debt - Developed	5.0%
Non-US Debt - Emerging	2.5%
US Treasuries (Cash Equivalents)	5.0%
TIPS (Inflation-Protected)	5.0%
Real Estate	10.0%
Hedge Funds	5.0%
Commodities	2.5%
Infrastructure	2.5%
Private Equity	5.0%
TOTAL PORTFOLIO	**100.0%**

Exhibit 9 shows expected annualized (geometric) returns for the hypothetical plan over a 10-year horizon. These results may be appropriate for modeling sensitivities of future funding results to short-term investment returns, or for evaluating the return assumption for a plan with severely negative cash flows or solvency issues.

Exhibit 9

Annualized Expected Returns
Hypothetical Multiemployer Pension Fund
10-Year Horizon

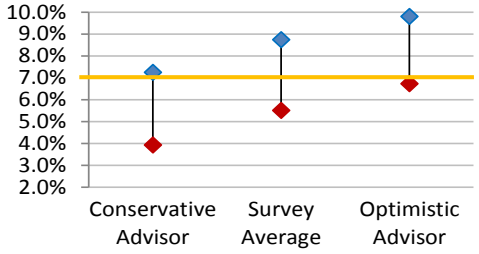


	Conservative Advisor	Survey Average	Optimistic Advisor
75th percentile	6.32%	8.16%	9.25%
25th percentile	2.27%	3.73%	4.87%
Probability of Meeting or Exceeding:			
7.50% per Year	14.2%	31.8%	44.6%
7.00% per Year	18.3%	37.4%	50.7%
6.50% per Year	23.1%	43.3%	56.8%

Exhibit 10 shows expected annualized (geometric) returns for the hypothetical plan over a 20-year horizon based on assumptions from the 13 advisors who provided longer-term assumptions. These results may be more appropriate for evaluating the return assumption for an ongoing plan with no projected solvency issues.

Exhibit 10

Annualized Expected Returns
Hypothetical Multiemployer Pension Fund
20-Year Horizon



	Conservative Advisor	Survey Average	Optimistic Advisor
75th percentile	7.25%	8.73%	9.80%
25th percentile	3.92%	5.50%	6.73%
Probability of Meeting or Exceeding:			
7.50% per Year	21.9%	43.7%	63.1%
7.00% per Year	28.3%	52.0%	71.0%
6.50% per Year	35.6%	60.2%	78.0%

Evaluating the Return Assumption (cont)

It is important to keep in mind that the expected returns shown in Exhibits 9 and 10 apply only to the hypothetical asset allocation shown in Exhibit 8. The expected returns will be different – perhaps significantly – for different asset allocations.

Exhibit 13 in the appendix to this report shows more detail regarding the derivation of the expected returns for this hypothetical pension plan.

The following are points to consider when reviewing the results in Exhibits 9 and 10:

Range of Reasonable Assumptions: When setting the investment return assumption for pension valuations, actuaries traditionally constructed a range of reasonable assumptions and then selected a best-estimate point within that range. Actuaries would often consider the reasonable range to be the middle 50 percent of possible results, bounded by the 25th and 75th percentiles.

The applicable actuarial standards of practice were updated in 2013, and the new standards de-emphasize use of the reasonable range when setting the investment return assumption. Nevertheless, considering this range remains instructive; it may be difficult for an actuary to justify an assumption outside of this range.

Based on the average assumptions in this 2018 survey, the middle 50 percent range for this hypothetical pension plan is very wide: 5.50% to 8.73% over the next 20 years. Note that the range is even wider for a 10-year horizon: 3.73% to 8.16%. This is due to the fact that, while returns may be volatile from one year to the next, deviations will be lower when returns are annualized (in other words, smoothed out) over longer horizons.

Probability of Meeting/Exceeding the Benchmark: For example, say that the actuary for this hypothetical pension plan expects its investment returns to be 7.00% per year, represented by the gold lines in Exhibits 9 and 10. Based on the average assumptions in this 2018 survey, there is a 52.0% probability the plan will meet or beat its 7.00% benchmark on an annualized basis over a 20-year period. The probability is lower, 37.4%, that the plan will meet or beat its benchmark over the next 10 years.

Also note that over a 20-year period, the probability that the annualized investment return will exceed 7.50% (arbitrarily, 50 basis points above the benchmark return) is 43.7%. The probability that the annualized return will exceed 6.50% (50 basis points below the benchmark) is 60.2%. These probabilities are a bit lower when focusing on a 10-year horizon rather than a 20-year horizon.

Optimistic and Conservative Assumptions: As previously noted, different investment advisors may have widely varying future capital market expectations. Therefore, it may also be interesting to consider the range of expected returns based on the assumptions provided by the most conservative and most optimistic advisors in the survey.

For this hypothetical asset allocation, the assumptions from the most conservative advisor indicate that the probability of beating the 7.00% benchmark assumption over the next 20 years is 28.3%. Using assumptions from the most optimistic advisor results in a probability of 71.0%. Again, reasonable people may differ.

Limitations: The following are some important limiting factors to keep in mind when reviewing these results. In most cases, adjustments made to account for these limitations tended to slightly lower the expected returns in the survey, for the sake of conservatism.

- The asset classes in this survey do not always align perfectly with the asset classes provided by the investment advisors. Adjustments were made to standardize the different asset classes provided.
- Many of the advisors develop their future assumptions based on investment horizons of no more than 10 years, and returns are generally expected to be lower in the short term. The typical multiemployer pension plan will have an investment horizon that is much longer than 10 years.
- The return expectations are based on indexed returns. In other words, they do not reflect any additional returns that may be earned due to active asset managers outperforming the market ("alpha"), net of investment expenses.
- The return expectations do not adjust for plan size. Specifically, they do not take into account the fact that certain investment opportunities are more readily available to larger plans, as well as the fact that larger plans may often receive more favorable investment fee arrangements than smaller plans.
- The ranges of expected annualized returns were constructed using basic, often simplified, formulas and methodologies. More sophisticated investment models – which may consider various economic scenarios, non-normal distributions, etc. – could produce significantly different results.

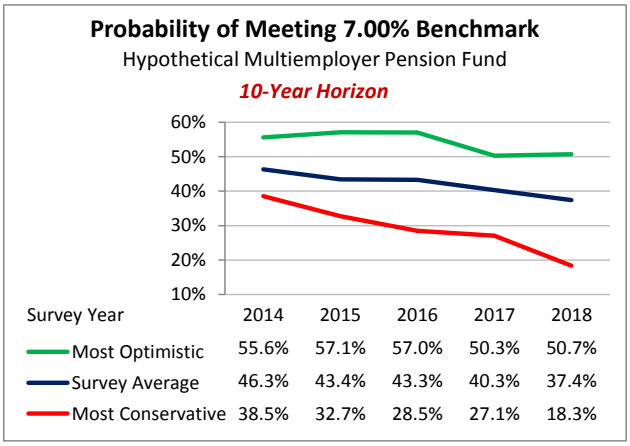
Use of the Survey: This survey is not intended to be a substitute for the expectations of individual portfolio managers, advisors, or actuaries performing their own independent analyses. The actuarial standards of practice provide for various methods of selecting the investment return assumption. This survey is intended to be used in conjunction with these methods, with appropriate weighting of various resources based on the plan actuary's professional judgment.

Comparison with Prior Surveys

Exhibits 6 and 7 showed how expected returns and standard deviations for certain asset classes have changed over the past few years. Similarly, Exhibits 11 and 12 below show how return expectations for the hypothetical multiemployer pension plan whose asset allocation is shown in Exhibit 8 have changed from 2014 to 2018.

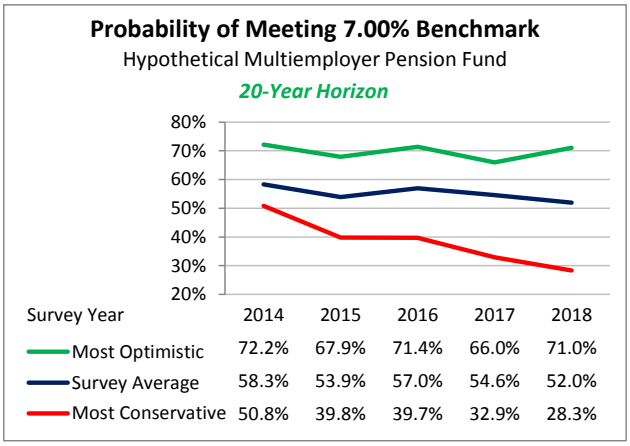
Both exhibits show the probabilities that the hypothetical pension plan will meet or exceed its 7.00% benchmark return on an annualized basis over the given time horizon. Exhibit 11 focuses on expected returns over a 10-year period, and Exhibit 12 focuses on expected returns over a 20-year period. Probabilities are shown for the survey average for each year from 2014 through 2018. For comparison, probabilities are also shown for the most conservative and optimistic advisors in each survey.

Exhibit 11



Survey Year	2014	2015	2016	2017	2018
Most Optimistic	55.6%	57.1%	57.0%	50.3%	50.7%
Survey Average	46.3%	43.4%	43.3%	40.3%	37.4%
Most Conservative	38.5%	32.7%	28.5%	27.1%	18.3%

Exhibit 12



Survey Year	2014	2015	2016	2017	2018
Most Optimistic	72.2%	67.9%	71.4%	66.0%	71.0%
Survey Average	58.3%	53.9%	57.0%	54.6%	52.0%
Most Conservative	50.8%	39.8%	39.7%	32.9%	28.3%

As shown in Exhibits 11 and 12, the probabilities that this hypothetical pension plan would meet or beat a benchmark return of 7.00% have generally decreased from 2014 to 2018. The decrease is more pronounced when considering a 10-year horizon versus a 20-year horizon.

For example:

- Based on the average assumptions from the 2018 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.00% over the next 10 years is 37.4%. For comparison, the probability was considerably higher (46.3%) five years ago when the 2014 survey was conducted.

- Based on the average assumptions from the 2018 survey, the probability of this hypothetical plan meeting or exceeding an annualized return of 7.00% over the next 20 years is 52.0%. While the probability was higher (58.3%) based on the average assumptions from 2014, the decrease over time for longer-term expectations is less pronounced than it has been for shorter-term expectations.

Other points of note when comparing the results from the 2018 survey to those from prior years:

- The results for the most conservative advisor in each survey from 2014 through 2018 have changed more dramatically than the results for the survey average and the most optimistic advisors. Based on the assumptions of the most conservative advisor in the 2014 survey, the probability of this hypothetical plan meeting or exceeding its 7.00% benchmark over the next 20 years was 38.5%. This can be compared to a probability of only 18.3% for the most conservative advisor in the 2018 survey.

- The results for the most optimistic advisor in each survey have generally remained more stable over the past five years, though there was a significant decrease in the probability of meeting the 7.00% benchmark over a 10-year horizon from 2016 to 2017. Nevertheless, the probability of meeting the 7.00% benchmark over a 10-year horizon based on the most optimistic advisor in the 2017 and 2018 surveys is still greater than 50%.

- Note that the most conservative and most optimistic advisors are not necessarily the same from year to year.

Glossary

The following are basic definitions of some of the investment terminology used in this report.

Expected Return

The *expected return* is the amount, as a percentage of assets, that an investment is expected to earn over a period of time. Expected returns presented in this survey are generally assumed to be indexed and net of fees.

Arithmetic vs. Geometric Returns

The *arithmetic* return is the average return in any one year; in other words, it has a one-year investment horizon. A *geometric* return is the annualized return over a multi-year period. In general, when evaluating expected returns over multi-year horizons, it is more appropriate to focus on geometric returns. However, arithmetic returns are also important. For example, the expected return of a portfolio is calculated as the weighted average of arithmetic returns, not geometric returns.

This survey focuses on geometric returns. Many advisors provide both arithmetic and geometric expected returns. For advisors who provided expected returns only on an arithmetic basis, we converted them to geometric returns for consistency. The following formula was used in making this conversion.

$$E[R_G] = ((1 + E[R_A])^2 - VAR[R])^{1/2} - 1$$

In this formula, $E[R_G]$ is the expected geometric return, $E[R_A]$ is the expected arithmetic return, and VAR[R] is the variance of the expected annual return.

Standard Deviation

The *standard deviation* is a measure of the expected volatility in the returns. Generally, the standard deviation expresses how much returns may vary in any one year. Assuming that returns are "normally distributed," there is about a 68% probability that the actual return for a given year will fall within one standard deviation (higher or lower) of the expected return. There is about a 95% probability that the actual return will fall within two standard deviations of the expected return.

Correlation

An important aspect of capital market assumptions is the degree to which the returns for two different asset classes move in tandem with one another: this is their *correlation*. For example, if two asset classes are perfectly correlated, their correlation coefficient will be 1.00; in other words, if one asset class has a return of X% in a given market environment, then the other asset class is expected to also have a return of X%. A portfolio becomes better diversified as its asset classes have lower (or even negative) correlations with each other.

Methodology

The following is a high-level description of the methodology used in compiling the survey results.

Standardized Asset Classes

Not all investment advisors use the same asset classes when developing their capital market assumptions. Some are very specific (more asset classes), while others keep things relatively simple (fewer asset classes).

We exercised judgment in classifying each advisor's capital market assumptions into a standard set of asset classes. In the event that an advisor did not provide assumptions for a given asset class, the average assumptions from the other advisors was used when developing expected returns for that advisor.

Investment Horizons

This survey considers "short-term" expected returns to apply to a 10-year investment horizon, and "long-term" expected returns to apply to a 20-year horizon.

In this 2018 edition of the survey, 23 of the 34 advisors provided only short-term assumptions, indicating a horizon of no more than 10 years. Included in this group are 2 advisors who provided assumptions over a horizon of 10 to 15 years.

All 13 advisors who provided long-term assumptions over horizons of 20 years or more also provided short-term assumptions. In cases where such an advisor indicated a horizon shorter than 10 years, the shorter-term expected returns were combined with the longer-term expected returns to achieve a 10-year horizon. If an advisor indicated a time horizon longer than 20 years, the longer-term expected returns were combined with the shorter-term expected returns to achieve a 20-year horizon.

No Adjustment for Alpha

No adjustment was made to reflect the possible value added by an active investment manager outperforming market returns (earning "alpha").

Normally-Distributed Returns

This survey assumes that investment returns will be normally distributed according to the capital market assumptions provided. The survey also assumes that the investment return in one year does not affect the investment return in the following year.

Equal Weighting

Each advisor was given equal weight in developing the average assumptions for the survey, regardless of factors such as total assets under advisement, number of clients in common with Horizon Actuarial, etc.

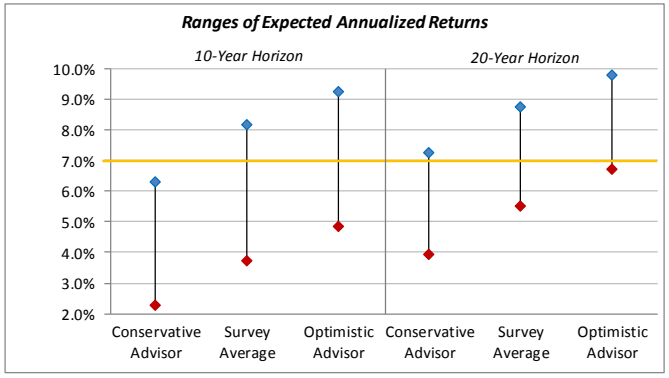
Exhibit 13

The following exhibit evaluates the investment return assumption for a hypothetical multiemployer pension plan. It reflects the same hypothetical asset allocation as shown in Exhibit 8, and it provides more detail than Exhibits 9 and 10. Note that the most conservative and optimistic advisors for the 10-year horizon are not necessarily the same as the most conservative and optimistic advisors for the 20-year horizon. This hypothetical pension plan has a benchmark return of 7.00% per year, which is indicated by the gold line in the exhibit below.

Hypothetical Multiemployer Plan
2018 Survey of Capital Market Assumptions

		Average Survey Assumptions		
Asset Class	Portfolio Weight	10-Year Horizon	20-Year Horizon	Standard Deviation
US Equity - Large Cap	20.0%	6.07%	7.42%	16.39%
US Equity - Small/Mid Cap	10.0%	6.57%	8.18%	20.20%
Non-US Equity - Developed	7.5%	6.71%	7.71%	18.67%
Non-US Equity - Emerging	5.0%	7.64%	8.82%	24.89%
US Corporate Bonds - Core	7.5%	3.37%	4.46%	5.71%
US Corporate Bonds - Long Duration	2.5%	3.32%	4.44%	10.83%
US Corporate Bonds - High Yield	5.0%	4.78%	5.82%	10.24%
Non-US Debt - Developed	5.0%	2.18%	3.22%	6.86%
Non-US Debt - Emerging	2.5%	5.00%	6.13%	11.43%
US Treasuries (Cash Equivalents)	5.0%	2.48%	3.05%	2.74%
TIPS (Inflation-Protected)	5.0%	2.88%	4.04%	6.25%
Real Estate	10.0%	5.90%	6.66%	13.86%
Hedge Funds	5.0%	4.96%	6.19%	7.87%
Commodities	2.5%	3.97%	4.92%	17.60%
Infrastructure	2.5%	6.56%	7.14%	14.74%
Private Equity	5.0%	8.33%	9.52%	22.16%
Inflation	N/A	2.24%	2.47%	1.76%
TOTAL PORTFOLIO	**100.0%**	*Expected returns are geometric.*		

	10-Year Horizon			*20-Year Horizon*		
	Conservative Advisor	**Survey Average**	**Optimistic Advisor**	**Conservative Advisor**	**Survey Average**	**Optimistic Advisor**
Expected Returns						
Average Annual Return (Arithmetic)	4.72%	6.45%	7.55%	6.16%	7.65%	8.74%
Annualized Return (Geometric)	4.29%	5.95%	7.06%	5.59%	7.12%	8.26%
Annual Volatility (Standard Deviation)	9.48%	10.38%	10.27%	11.03%	10.72%	10.19%
Range of Expected Annualized Returns						
75th Percentile	6.32%	8.16%	9.25%	7.25%	8.73%	9.80%
25th Percentile	2.27%	3.73%	4.87%	3.92%	5.50%	6.73%
Probabilities of Exceeding Certain Returns						
7.50% per Year, Annualized	14.2%	31.8%	44.6%	21.9%	43.7%	63.1%
7.00% per Year, Annualized	18.3%	37.4%	50.7%	28.3%	52.0%	71.0%
6.50% per Year, Annualized	23.1%	43.3%	56.8%	35.6%	60.2%	78.0%



Considerations and Limitations

- Allocations may be approximated if certain asset classes are not included in the survey.
- Many investment advisors provided only shorter-term assumptions (10 years or less).
- Assumptions are based on indexed returns and do not reflect anticipated alpha.
- Assumptions do not reflect investment opportunities or fee considerations available to larger funds.

SOURCE: Horizon Actuarial 2018 Survey of Capital Market Assumptions

Expected returns over a 10-year horizon include all 34 survey participants.

Expected returns over a 20-year horizon are based a subset of 13 survey participants who provided longer-term assumptions.

Exhibit 14

The following exhibit shows the distribution of expected annualized returns and annual standard deviations for the same hypothetical asset allocation that is shown in Exhibit 13. The expected annualized return and annual standard deviation of the hypothetical asset allocation are shown separately for each advisor who participated in the survey. Individual advisors are grouped by type and investment horizon, and the survey average assumptions are shown in red. The exhibit shows that there are a wide variety of investment return assumptions that could be considered to be reasonable for any given asset allocation.

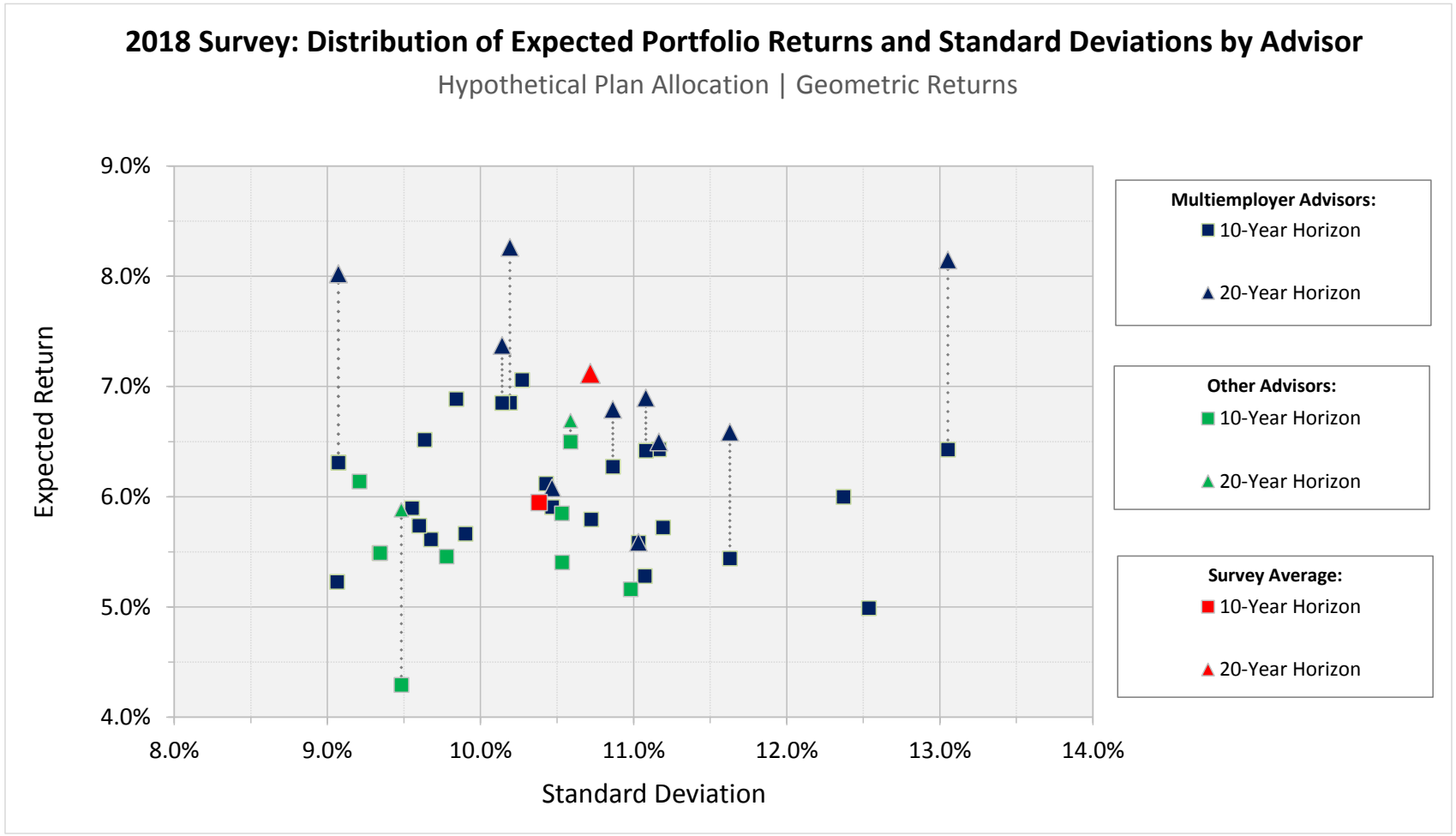


Exhibit 15

The following exhibit provides the average capital market assumptions for all 34 investment advisors in the 2018 survey. Each of the 34 advisors was given equal weight in determining the average assumptions. For reference, expected returns are shown over 10-year and 20-year horizons. Expected returns are also provided on both an arithmetic basis (one-year average) and geometric basis (multi-year annualized). The standard deviations (volatilities) and correlations apply to both arithmetic and geometric expected returns.

Horizon Actuarial 2018 Survey of Capital Market Assumptions

Average Survey Assumptions

		Expected Returns				
		10-Year Horizon		20-Year Horizon		Standard
	Asset Class	Arith.	Geom.	Arith.	Geom.	Deviation
1	US Equity - Large Cap	7.34%	6.07%	8.73%	7.42%	16.39%
2	US Equity - Small/Mid Cap	8.49%	6.57%	10.13%	8.18%	20.20%
3	Non-US Equity - Developed	8.36%	6.71%	9.46%	7.71%	18.67%
4	Non-US Equity - Emerging	10.52%	7.64%	11.94%	8.82%	24.89%
5	US Corporate Bonds - Core	3.54%	3.37%	4.63%	4.46%	5.71%
6	US Corporate Bonds - Long Duration	3.90%	3.32%	5.14%	4.44%	10.83%
7	US Corporate Bonds - High Yield	5.29%	4.78%	6.44%	5.82%	10.24%
8	Non-US Debt - Developed	2.37%	2.18%	3.56%	3.22%	6.86%
9	Non-US Debt - Emerging	5.63%	5.00%	6.85%	6.13%	11.43%
10	US Treasuries (Cash Equivalents)	2.55%	2.48%	3.10%	3.05%	2.74%
11	TIPS (Inflation-Protected)	3.08%	2.88%	4.26%	4.04%	6.25%
12	Real Estate	6.89%	5.90%	7.67%	6.66%	13.86%
13	Hedge Funds	5.29%	4.96%	6.61%	6.19%	7.87%
14	Commodities	5.46%	3.97%	6.47%	4.92%	17.60%
15	Infrastructure	7.61%	6.56%	8.24%	7.14%	14.74%
16	Private Equity	10.72%	8.33%	12.17%	9.52%	22.16%
	Inflation	2.24%	2.24%	2.48%	2.47%	1.76%

Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.00															
2	0.89	1.00														
3	0.84	0.76	1.00													
4	0.72	0.67	0.79	1.00												
5	0.12	0.07	0.14	0.14	1.00											
6	0.11	0.05	0.13	0.10	0.83	1.00										
7	0.61	0.60	0.60	0.62	0.36	0.26	1.00									
8	0.17	0.11	0.30	0.24	0.55	0.55	0.24	1.00								
9	0.54	0.49	0.58	0.66	0.44	0.37	0.59	0.41	1.00							
10	(0.10)	(0.12)	(0.09)	(0.07)	0.33	0.28	(0.03)	0.26	0.06	1.00						
11	0.05	0.01	0.10	0.16	0.68	0.57	0.31	0.52	0.40	0.33	1.00					
12	0.44	0.41	0.40	0.33	0.10	0.11	0.30	0.09	0.24	0.03	0.10	1.00				
13	0.66	0.64	0.68	0.67	0.14	0.06	0.58	0.15	0.48	(0.07)	0.13	0.35	1.00			
14	0.31	0.29	0.39	0.43	0.10	0.03	0.35	0.22	0.34	0.02	0.26	0.24	0.42	1.00		
15	0.54	0.49	0.53	0.47	0.20	0.21	0.41	0.33	0.43	(0.08)	0.18	0.31	0.41	0.29	1.00	
16	0.73	0.69	0.70	0.61	0.03	0.03	0.48	0.10	0.40	(0.08)	0.04	0.39	0.60	0.30	0.39	1.00

Expected returns over a 10-year horizon include all 34 survey participants.

Expected returns over a 20-year horizon are based a subset of 13 survey participants who provided long-term assumptions.

Exhibit 16

Earlier in this report, Exhibit 5 showed the distribution of expected returns and standard deviations over an investment horizon of 10 years. The exhibit below shows the same distribution, but for a horizon of 20 years. Note that while Exhibit 5 included assumptions for all 34 advisors in the survey, the exhibit below includes only assumptions for the 13 advisors who provided longer-term assumptions (horizons of 20 years or more).

2018 Survey: Distribution of Expected Returns and Standard Deviations

20-Year Horizon | Geometric Returns

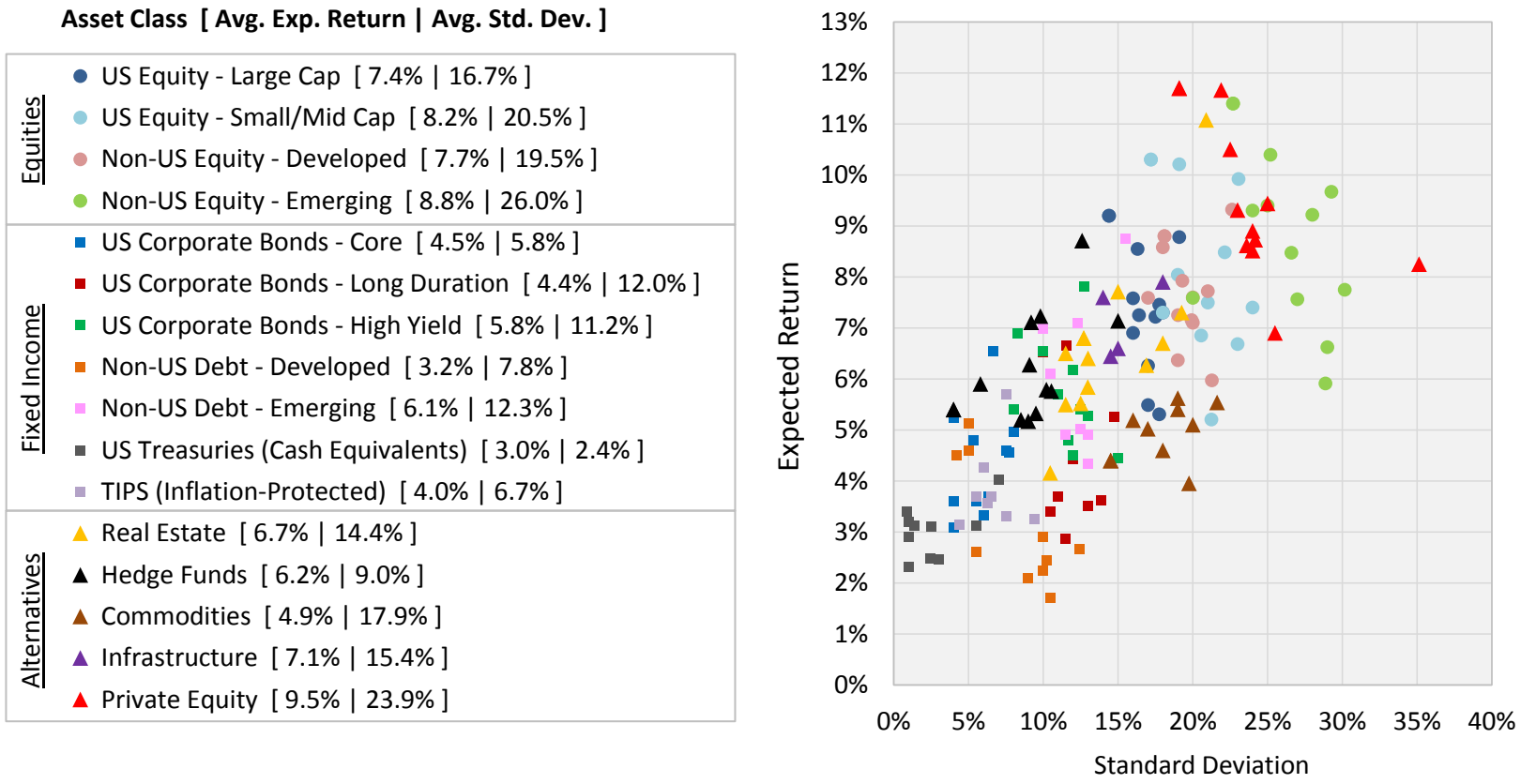
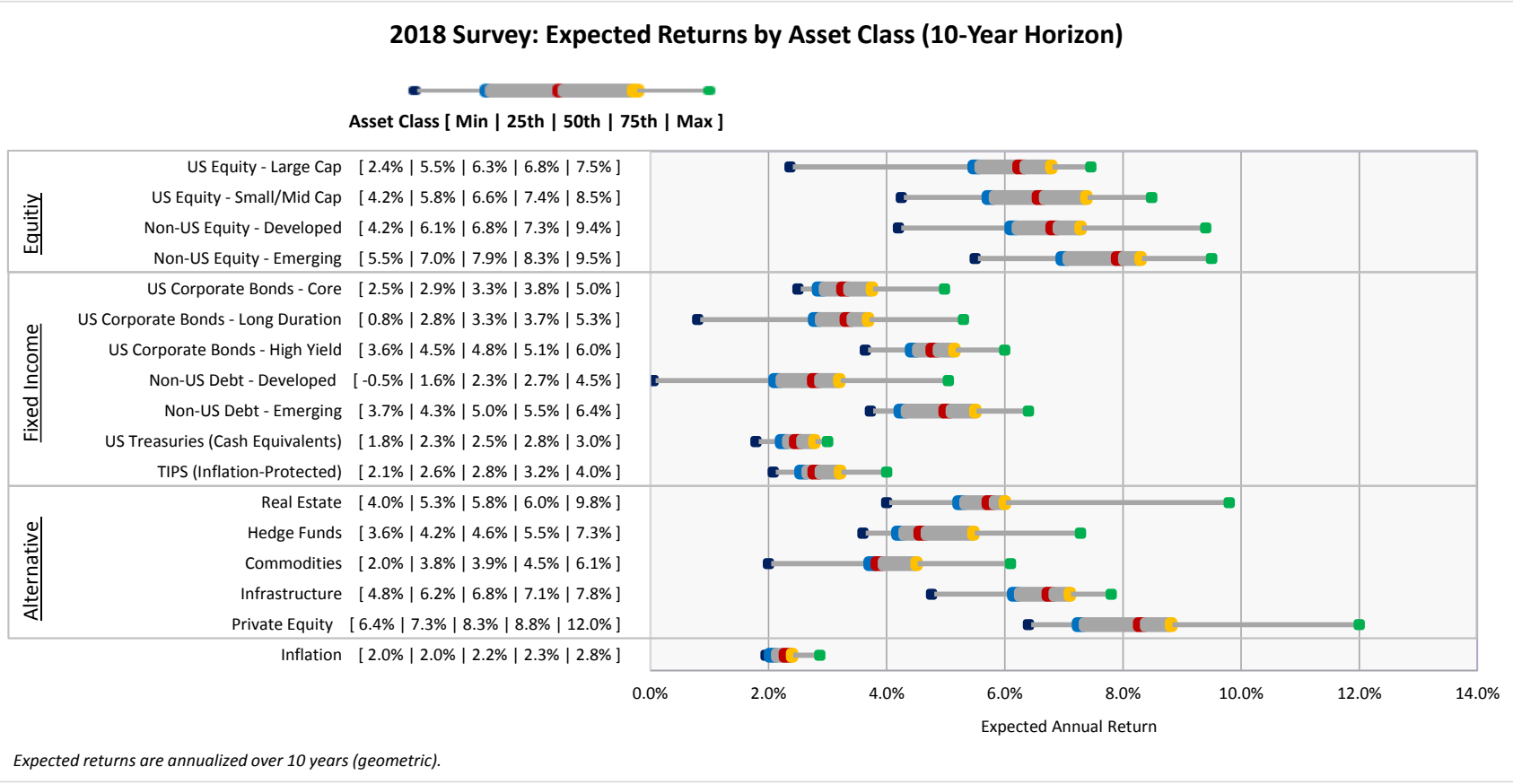


Exhibit 17

The exhibit below shows the ranges of expected annual returns for different asset classes over a 10-year investment horizon. The ranges shown below include assumptions for all the 34 advisors in the 2018 survey. Expected returns shown below are annualized (geometric).

To illustrate the distribution of expected returns, the exhibit shows the range of the middle 50 percent of results: the range between the 25th and 75th percentiles. It also shows the median expected return for each asset class: the 50th percentile. Note that the expected returns for the *median* advisor shown below are not the same as the *average* expected returns shown elsewhere in the report. In most cases, however, the differences between median and average expected returns are relatively small.

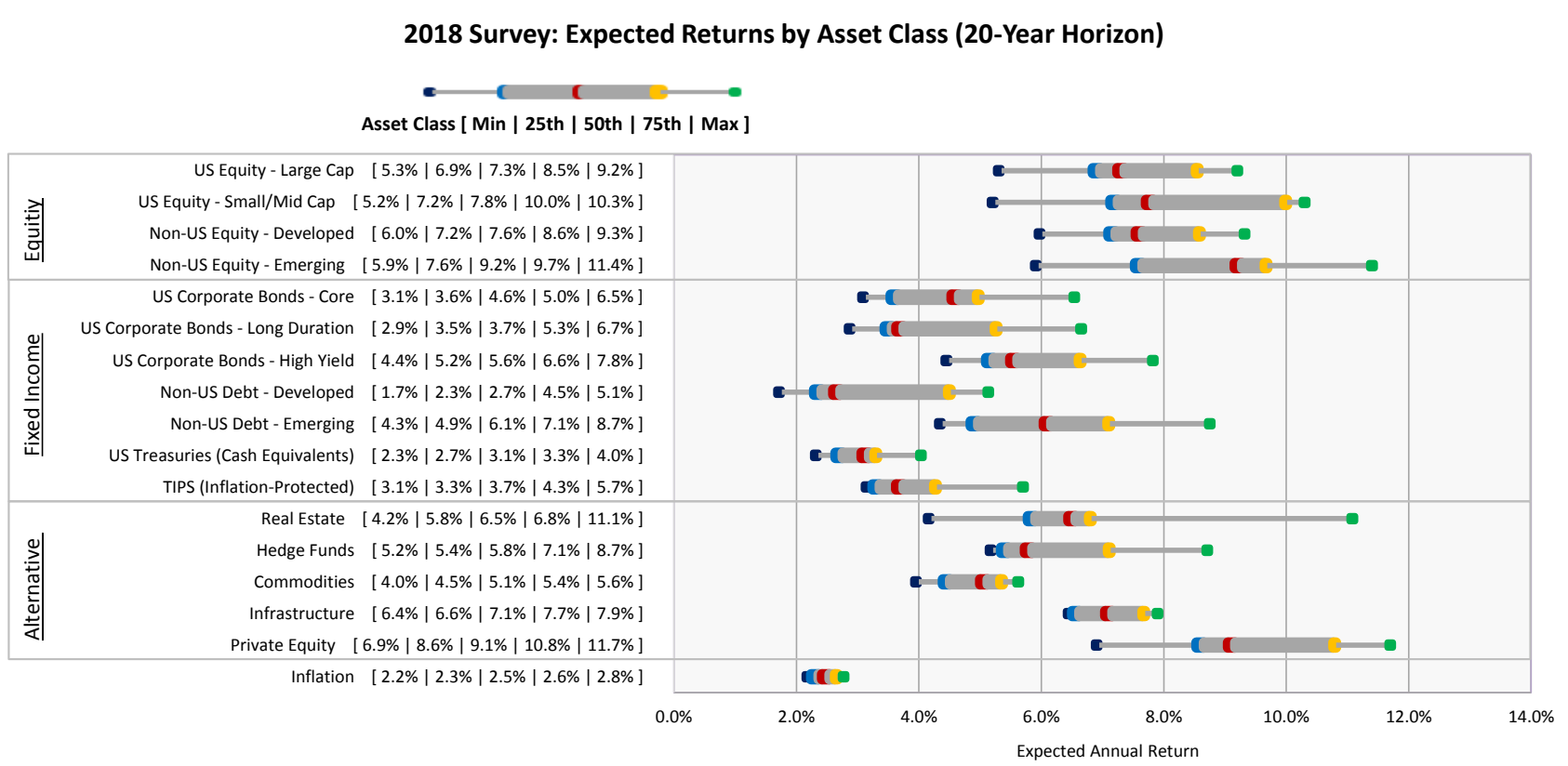


Expected returns are annualized over 10 years (geometric).

Exhibit 18

The exhibit below shows the ranges of expected annual returns for different asset classes over a 20-year investment horizon. The ranges shown below are based on the assumptions for 13 advisors who provided longer-term assumptions (horizons of 20 years or more). Expected returns shown below are annualized (geometric). Note that the ranges of expected returns are somewhat narrower when the investment horizon is longer.

To illustrate the distribution of expected returns, the exhibit shows the range of the middle 50 percent of results: the range between the 25th and 75th percentiles. It also shows the median expected return for each asset class: the 50th percentile. Note that the expected returns for the *median* advisor shown below are not the same as the *average* expected returns shown elsewhere in the report. In most cases, however, the differences between median and average expected returns are relatively small.



Expected returns are annualized over 20 years (geometric), based on a subset of 13 advisors who provided longer term assumptions.